THE NEW JERSEY ZINC COMPANY, INC.
ENVIRONMENTAL CONTROL MEMORANDUM

Palmerton, PA
November 30, 1981-dgc

ASSESSMENT OF EFFECT OF RAW MATERIAL

AND SLUDGE STORAGE AREAS ON GROUND WATER.

This report was prepared in accordance with Part C, Paragraph 8b of the National Pollution Discharge Elimination System (NPDES) Permit No. PA 0012751 issued to The New Jersey Zinc Company on January 2, 1980.

Summary

Palmer Water Company Curb Wells Nos. 9, 9A, 9C, and 9D tapped ground water at depths 12 to 24 feet below grade in the uppermost aquifer before they were retired from regular service. Well 9D, the last well to be in service, was retired in July 1981. The wells are located in the East Plant within 500 feet of the Company's raw material and sludge storage areas. Results of analyses of water samples collected from these wells between 1971 and 1981 indicate an upward trend in zinc and cadmium content when the wells drew water for extended periods of several months to several years. When the wells were retired from regular service and only operated for short intervals of a few hours or less, no such trend was found. The storage areas apparently have little effect on the aquifer when natural flow conditions prevail.

Discussion

Part C, Paragraph 8b, requires The New Jersey Zinc Company to perform an assessment of the effect of the raw material and waste acid sludge storage areas on ground water. The Palmer Water Company Wells Nos. 9, 9A, 9C, and 9D are located near the storage areas and may be shallow enough to reflect effects of leachate from these areas. If we assume the ground water flows from the Blue Mountain to the Aquashicola Creek, the wells are then "down aquifer" of the storage area.

Most data presented in this report are from routine sampling conducted by the Palmer Water Company and analyzed by NJZ. Some samples were collected by the Environmental Protection Agency between May 1 and 15, 1979 and by the Pennsylvania Department of Environmental Resources on November 13, 1978. All others were collected by NJZ personnel.

All samples identified with Well 9A contain water from both Well 9 and 9A. Well 9A and Well 9 are connected by a syphon. Wells 9 and 9A were retired before 1971. 1934

All samples identified with Well 9C up to July 1979 contain water syphoned from Well 9D. In July 1979, Well 9C was retired and a pump was installed in 9D which operated until July 1981 when it too was retired.

The data are confined to analyses for total zinc, cadmium and manganese because these were the only metallic constituents for which data are available over the period of the study.

Figure 1 is a graph of available analyses for total zinc and cadmium from water samples collected from Wells 9A, 9C and 9D from 1971 through 1981.

Figure 2 contains separate graphs of each component in samples from Wells 9C and 9D. The data illustrated in Figures 1 and 2, and additional data concerning manganese and the effect of precipitation, are contained in Table 1.

Figure 3 shows the location of Palmer Water Company Wells 9, 9A, 9B, and 9C and the raw material and waste acid sludge storage and handling areas. The wells are from 350 feet (9D) to 500 feet (9C) from the north border of the storage and handling area.

Figure 4 is a schematic elevation of each of the wells.

The data indicate that in 1971, Well 9A had comparatively high concentrations of zinc and cadmium in the range of 7 to 17 ppm and 0.1 to 0.4 ppm,

respectively. Wells 9C and 9D had concentrations of zinc and cadmium generally in the ranges of 0.5 to 2 ppm and 0.005 to 0.012, respectively. These concentrations apparently persisted through 1977 (one data point). In late 1978 and early 1979, concentrations of zinc and cadmium in Well 9D increased to as high as 5 ppm and 0.028, respectively. Well 9C was removed from service in July 1979 and only Well 9D remained active. The data indicate that once Well 9D became the sole tap in that area of the aquifer, the cadmium content of that well water increased.

The zinc concentration in Well 9D had begun to increase in early 1979 and continued to increase after July 1979. In July 1981, Well 9D was retired.

In August 1981, a sample of water taken from Well 9D showed lower zinc and noticeably lower cadmium concentration than were detected in 1971. This is similar to the drop in concentration of zinc and cadmium in Well 9A between 1971 and 1977. Apparently, the water which naturally migrates past the well locations is low in zinc and cadmium content.

Conclusion

The raw material and sludge storage areas may be the source of the zinc and cadmium found in curb wells, but these areas apparently have little effect on ground water as near as 350 feet away when natural ground water flow is undisturbed.

Migration of metals in higher than normal amounts apparently occurs only when the natural ground water flow is altered by mechanical means. With the curb wells now idle, the effect of the raw material and sludge storage areas will presumably be minimal.

M. R. Silvestris

TABLE 1

ANALYSES OF WELL WATER SAMPLES
1971 TO 1981

Date	Well	Total Zn mg/l	Total Cd mg/l	Total Mn mg/l	Last Rainfall Date	Last Rainfall Amount (In.)	Remarks
3/30/71	9A	8.6	--	.20	3/22	.02	
	9C	1.8	--	.03			
	9D	0.5	--	.01			
5/ 7/71	9A	7	0.4	.07	5/ 6	.2	
	9C	0.6	.01	<.01			
	9D	0.6	.01	.01			
6/16/71	9A	17	.17	1.3	6/13-15	.8	
	9C	.65	.01	<.01			
	9D	.54	.01	<.01			
7/29/71	9A	7.5	.14	.05	7/29	.7	
	9C	.24	.007	.01			
9/ 2/71	9A	15.5	.12	1.7	8/26-28	3.3	
	9C	.58	.006	.005			
9/ 7/77	9C	1.2	0.007	0.01			
11/13/78	9C	3.06	0.019		10/27	.01	DER Sam. & Analysis
	9D	0.69	0.004				
1/16/79	9C	6.0	.031	--	1/13	.11	
1/17/79	9C	2.3	.018	--	1/13		Well 9C Analysis is
1/18/79	9C	4.5	.029	--	1/17	.08	Combination of 9C
	9D	.6	.003				and 9D Until 7/79
1/22/79	9C	4.5	.019	.043	1/20-21	2.3	
1/29/79	9C	6.8	.052	.13	1/24-25	1.3	
1/30/79	9C	6.3	.023	.06	1/24-25		
	9D	1.0	.003	<.01			
2/ 1/79	9C	4.8	.028	.06	1/24-25		
2/ 6/79	9C	4.7	.030	.06	1/24-25		
2/ 8/79	9C	4.6	.027	.06	2/ 8	Snow	
2/12/79	9C	3.9	.031	.06	2/12	Snow	
2/14/79	9C	5.5	.023	.05	2/12	Snow	
2/16/79	9C	3.9	.017	.05	2/12	Snow	
2/20/79	9C	3.5	.019	.04	2/19	Snow	
2/22/79	9C	3.0	.015	.04	2/21	.07	
2/26/79	9C	4.3	.033	.06	2/23-26	1.6	
2/28/79	9C	3.1	.018	.04	2/23-26		
3/ 2/79	9C	6.1	.025	.06	2/23-26		
3/ 5/79	9C	7.3	.044	.09	3/ 4- 5	.48	
3/ 9/79	9C	6.3	.041	.08	3/ 4- 6	.6	
	9D	1.0	.002	<.01			

TABLE I - ANALYSES OF WELL WATER SAMPLES (Contd.)

Date	Well	Total Zn mg/l	Total Cd mg/l	Total Mn mg/l	Last Rainfall Date	Last Rainfall Amount (In.)	Remarks
3/14/79	9A	2.0	.010	.03			
3/21/79	9C	3.0	.015	.03	3/14	.05	
3/26/79	9C	5.5	.019	.04	3/24-25	.59	
3/29/79	9C	4.1	.019	.05	3/29	.06	
	9D	1.0	.002	<.01			
4/ 2/79	9C	4.9	.019	.04	3/31	.08	
4/ 4/79	9C	2.7	.017	.04	4/ 2- 4	1.04	
	9D	1.1	.002	<.01			
4/30/79	9D	1.3	.016	.01	4/26-28	1.49	
5/ 1-	9A	1.4	.01	.06	5/ 3	.28	USEPA (NEIC) Sam-
15/79	9C	2.8	.02	.05			ples and Analy-
	9D	.68	<.01	<.01			sis
5/16/79	9C	5.2	.018	.05	5/12-15	.62	
5/23/79	9D	.65	.002	<.01	5/23	1.2	
6/ 4/79	9D	1.2	.018	.02	6/ 3	.44	
6/ 8/79	9D	2.0	.005	<.01	6/ 5	.05	
6/11/79	9D	1.6	.009	.02	6/11	.77	
6/25/79	9C	2.5	.015	.04	6/22	.17	
	9D	.55	<.002	<.01			
							Wells 9C and 9D Were Separated in 7/79
10/ 4/79	9D	5.1	.038	.06	10/ 1 & 3	3.41	
10/10/79	9C	4.0	.031	.03	10/ 9-10	.34	
	9D	2.2	.013	.03			
10/16/79	9D	4.9	.04	.06	10/12	.07	
10/18/79	9D	.74	.007	<.01	10/17	.01	
10/22/79	9D	1.3	.011	.02	10/17		
11/15/79	9D	1.3	.013	.01	11/15	.05	
2/18/80	9D	1.9	.015	.02	2/16	Snow	
7/23/80	9D	1.25	.013	.01	7/22-23	.74	
8/19/80	9D	.83	.010	.01	8/18	.01	
9/30/80	9D	.97	.013	.01	9/25	.18	
10/14/80	9D	.76	.011	.009	10/13	.01	
11/11/80	9D	1.52	.021	.02	11/ 9	.22	
11/24/80	9D	1.9	.02	.02	11/24	1.10	

TABLE 1 - ANALYSES OF WELL WATER SAMPLES (Contd.)

Date	Well	Total Zn mg/l	Total Cd mg/l	Total Mn mg/l	Last Rainfall Date	Last Rainfall Amount (In.)	Remarks
12/ 4/80	9D	.52	.002	.02	12/ 2	.08	
12/23/80	9D	1.84	.023	.02	12/ 9	.05	
12/30/80	9D	1.8	.023	.016	12/ 9		
1/14/81	9D	1.99	.020	.02	1/ 7	Snow	
1/22/81	9D	1.1	.011	.01	1/15	Snow	
2/18/81	9D	1.9	.015	.02	2/16	.01	
3/ 5/81	9D		.042		2/21	.01	
3/12/81	9D	1.7	.017	.02	2/21		NJZ
		.93	.008	.01			DER
4/30/81	9D	1.3	.016	.01	4/29-30	.14	
5/ 5/81	9D	1.5	.018	.03	4/29-30		
5/16/81	9D	2.2	.027	.03	5/15	1.34	
5/26/81	9D	2.1	.021	.02	5/26	.17	
6/ 4/81	9D	1.2	.018	.02	6/ 4	.11	
6/11/81	9D	1.6	.019	.02	6/10	.08	
8/27/81	9D	.2	<.002	.05	8/15	.07	9D Out of Service

FIGURE 1

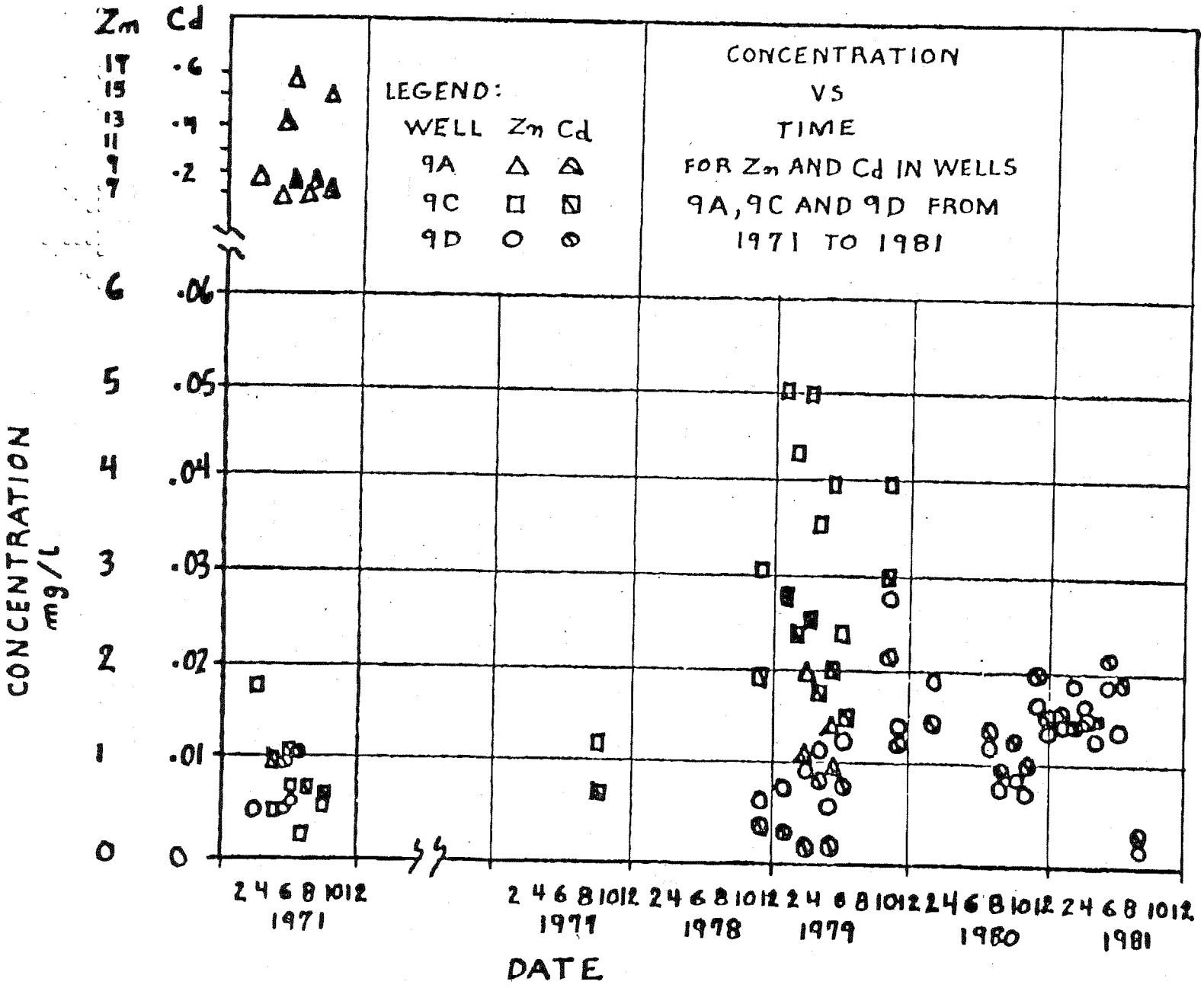

Zn
Cd
17
15
13
11
9
7
.6
.4
.2
6
5
4
3
2
1
0
.06
.05
.04
.03
.02
.01
0
LEGEND:
WELL Zn Cd
9A
9C
9D
CONCENTRATION
VS
TIME
FOR Zn AND Cd IN WELLS
9A, 9C AND 9D FROM
1971 TO 1981
CONCENTRATION
mg/L
2 4 6 8 10 12
1971
1977
1978
1979
1980
1981
DATE

FIGURE 2

Figure 2A

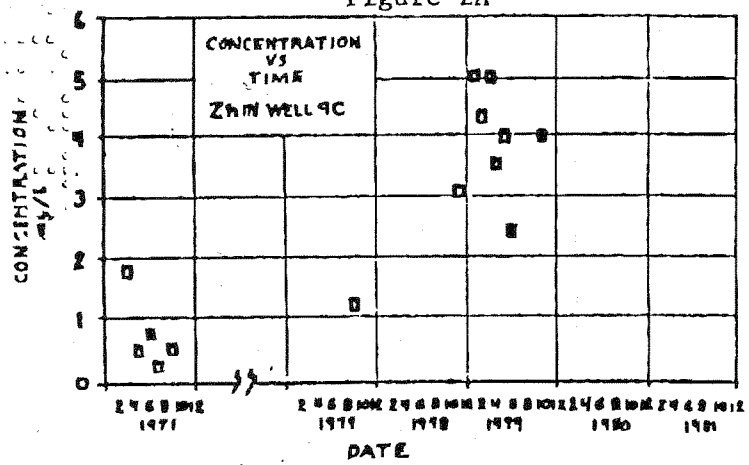


Figure 2C

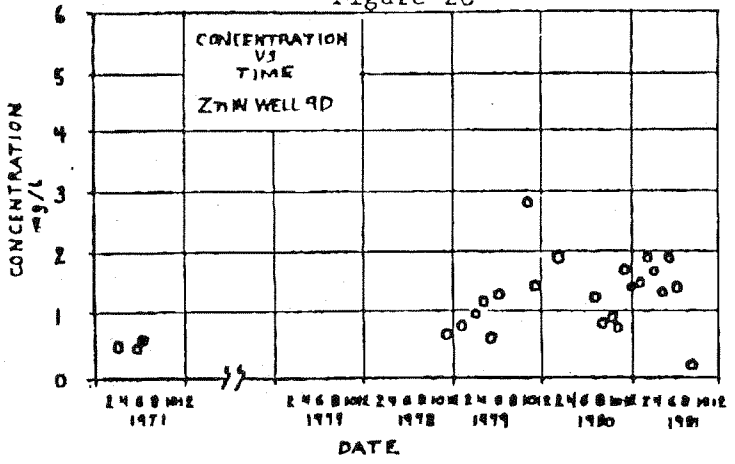
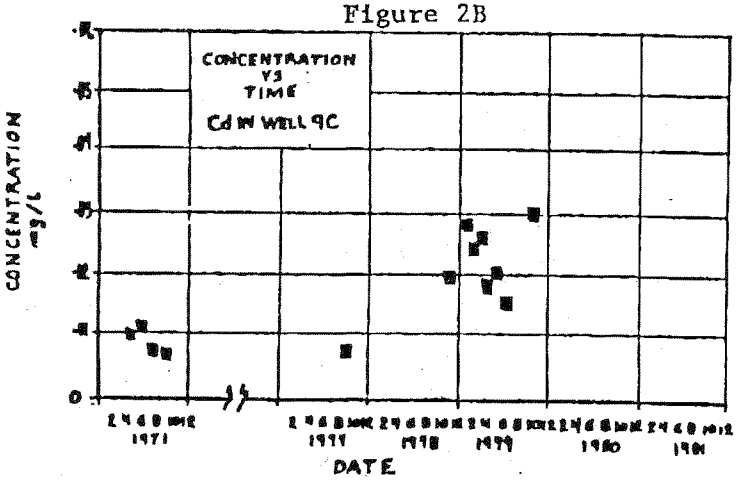


Figure 2B



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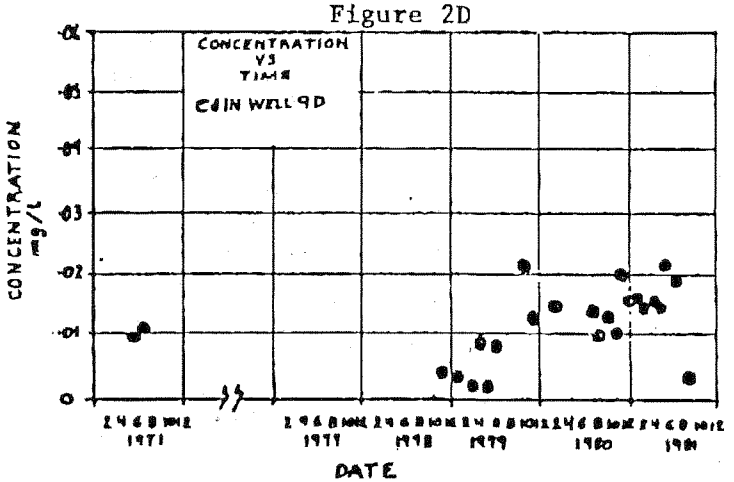
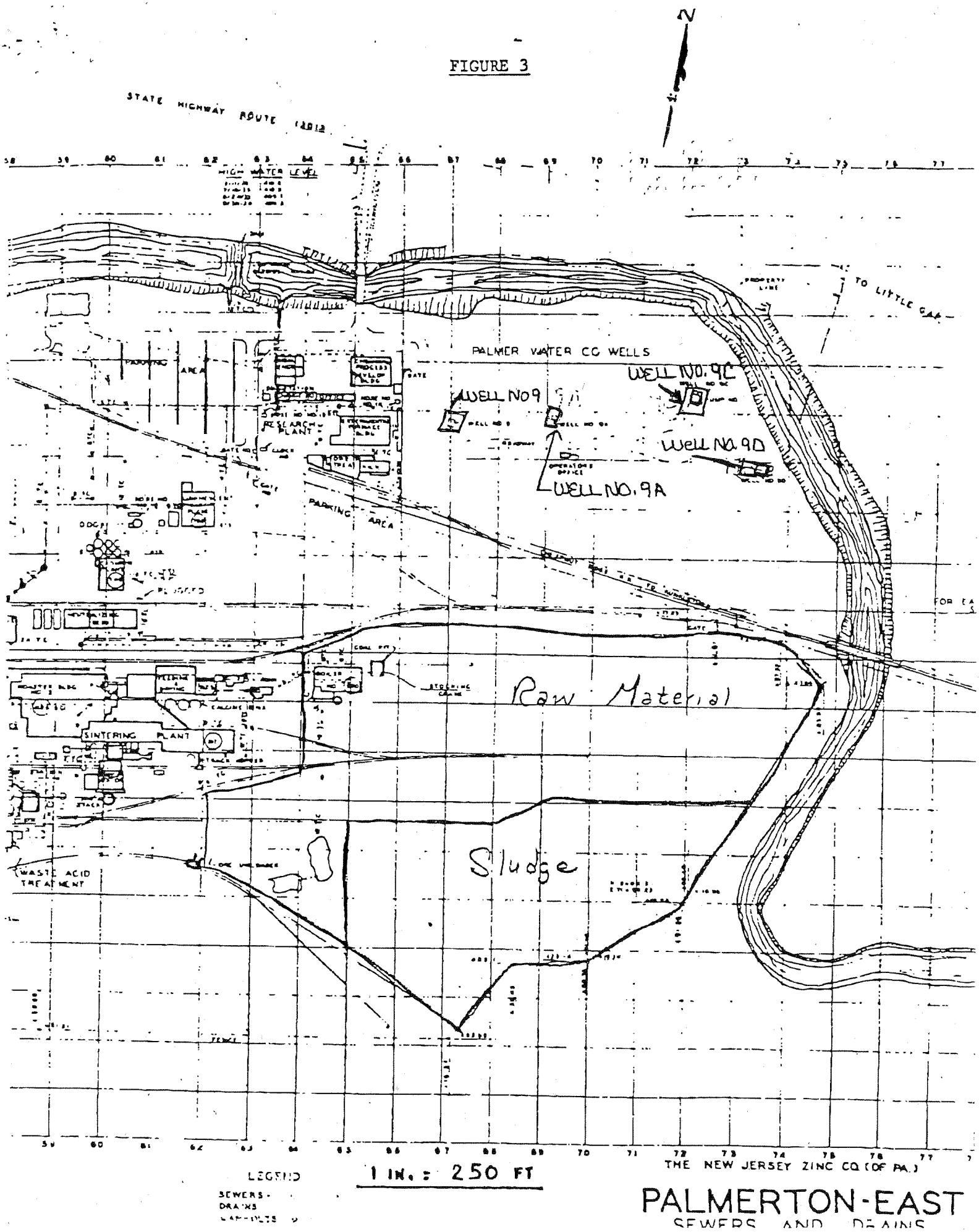
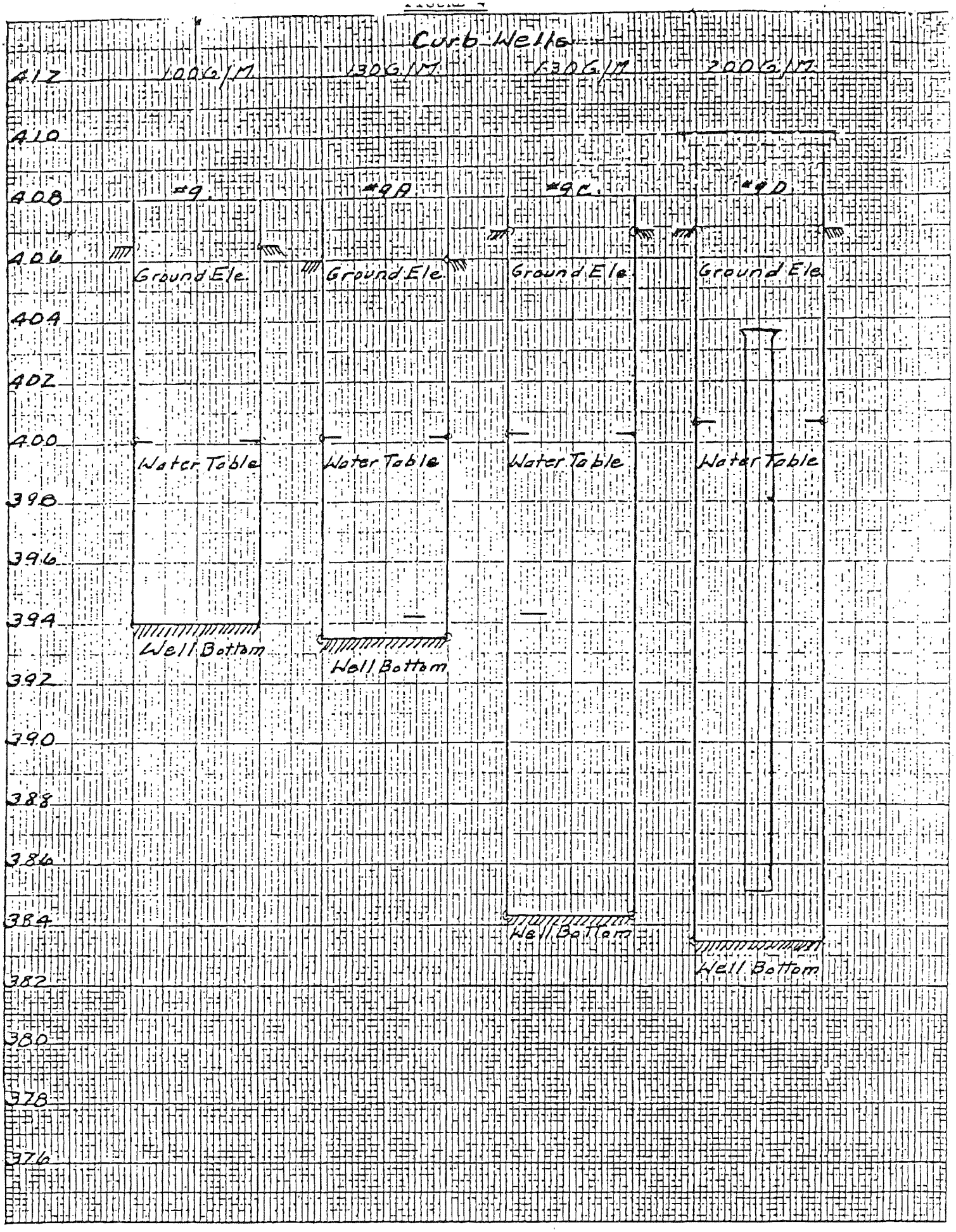


FIGURE 3



PALMERTON-EAST
SEWERS AND DRAINS


Curb Wells
100 G/M
130 G/M
130 G/M
200 G/M
#9
#9A
#9C
#9D
Ground Ele.
Ground Ele.
Ground Ele
Ground Ele
Water Table
Water Table
Water Table
Water Table
Well Bottom
Well Bottom
Well Bottom
Well Bottom
412
410
408
406
404
402
400
398
396
394
392
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388
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382
380
378
376

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May 9, 1979

Palmer Water Company
c/o New Jersey Zinc Company
Palmerton, Pennsylvania 18071

Attention: Claude E. Hensinger, P.E.

Re: Water Supply Study
Preliminary Report

Gentlemen:

In accordance with our telephone discussion of May 3, 1979, we are transmitting herewith, three (3) copies of our Preliminary Engineering Report, dated May 1979, and titled, "Water Supply Study."

We have completed the engineering services described in our Proposal of February 16, 1979. We were in the process of preparing a complete and final Engineering Report for submission to you when your request for immediate information was received. We have, therefore, prepared this preliminary report setting forth the conclusions and recommendations resulting from our engineering studies.

In order to conserve time, this Preliminary Engineering Report does not contain the detailed background information developed during the course of the study. These details support the conclusions and recommendations submitted herein. Since this preliminary report may contain all the information you require, we will not prepare a final detailed report until you have had the opportunity to review this preliminary report, and to discuss its findings with us.

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

Palmer Water Company
May 9, 1979

After you have reviewed the Preliminary Engineering Report, we will be glad to meet with you to discuss the findings and to answer any questions you may have in regard to the findings.

We thank you for this opportunity to serve you.

Very truly yours,

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

Stephen F. Talian

STEPHEN F. TALIAN
Project Manager, Hydraulic Division

SFT:rp

cc: A. L. Gorczyca, C.P.M.

PALMER WATER COMPANY

PALMERTON, PENNSYLVANIA

WATER SUPPLY STUDY

Preliminary
ENGINEERING REPORT
May 1979

Gannett Fleming Corddry and Carpenter, Inc.
ENGINEERS
Harrisburg Pennsylvania

PALMER WATER COMPANY
WATER SUPPLY STUDY

PRELIMINARY REPORT
May 1979

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PALMER WATER COMPANY

WATER SUPPLY STUDY

PRELIMINARY REPORT
May 1979

CONCLUSIONS

The following conclusions result from the investigations and analyses made for this report:

(1) The current average daily demand on the water system is approximately 0.75 million gallons per day (mgd), and the estimated "design" average daily demand is 0.80 mgd.

(2) System records indicate that maximum daily demands normally range from about 1.25 to 1.30 times average daily demands.

(3) The estimated "design" maximum daily demand is 1.00 mgd, which is equivalent to 700 gallons per minute (gpm).

(4) Well No. 9C is subject to cadmium concentrations that exceed the maximum contaminant level of the U. S. Environmental Protection Agency (EPA) Interim Primary Drinking Water Regulations.

(5) Hydrogeologic conditions in the vicinity of Well No. 9C indicate that excessive cadmium concentrations are likely to exist throughout the future.

(6) Treatment for cadmium removal is not feasible in comparison to other source development alternatives.

(7) Future water system planning should not include Well No. 9C or the other Curb Wells.

(8) It is not feasible to rehabilitate or operate the existing water treatment plant for the Pohopoco Creek industrial supply.

(9) The three existing deep wells (Well Nos. 4, 6, and 7), which are the only reliable sources presently available to the system, have an estimated safe yield (drought) of 0.50 or 350 gpm.

(10) A comparison of safe yield to maximum daily demand indicates that the water system should develop additional source capacity of at least 0.5 mgd (350 gpm) to satisfy demands.

(11) Hydrogeologic investigations indicate that ample supplies of good quality water can be developed from wells constructed in nearby bedrock or glacial outwash formations.

(12) The Bloomsburg, Stormville-Decker, and Poxono Island Formations offer the best potential for development of deep well supplies.

(13) The complex structural geology of the area may have important bearing on ground water availability to deep wells.

(14) Based on the hydrogeologic studies, two areas are identified as having the best deep well development potential. These are Area I (Bloomsburg) and Area II (Stormville-Decker and Poxono Island), as shown on Exhibit A.

(15) The Wisconsinan Glacial Outwash has the greatest well yield potential of the unconsolidated (surficial) formations in the area.

(16) The extent of the Wisconsinan Glacial Outwash, which attains a maximum depth of about 60 feet, is shown on Exhibit B. These deposits also fill a buried channel along Aquashicola Creek.

(17) Existing Well No. 9C, and the other Curb Wells, are constructed within the Wisconsinan Glacial Outwash.

(18) Wells constructed in the glacial outwash normally depend on recharge from stream infiltration for a significant portion of well yield.

(19) The two glacial outwash areas that have the best well development potential are Area III (Distant Outwash) and Area IV (Close Outwash), shown on Exhibit B.

(20) Area III is located outside the area that is subject to contamination from existing waste piles.

(21) The possibility of contamination from existing waste piles encroaching on Area IV is remote.

(22) Additional shallow well construction should not be done in the vicinity of the existing Curb Wells due to potential contamination.

(23) The existing deep wells, including the West Plant Well and the Acid Plant Well, are subject to potential contamination from existing waste piles.

(24) The West Plant Well, constructed in the Bloomsburg Formation, has an estimated safe yield of 100 gpm.

(25) The water quality of the West Plant Well appears satisfactory for public supply use, with the possible exception of slightly excessive iron and manganese concentrations.

(26) The West Plant Well should be developed for public water supply use, with treatment for disinfection (chlorination) and iron and manganese control (sequestering with polyphosphate).

(27) Assuming development of 100 gpm safe yield from the West Plant Well, the water system would need to develop a minimum additional safe yield of 250 gpm.

(28) It is <u>likely</u>, though somewhat uncertain, that the required additional safe yield can be developed by constructing deep wells in either Area I or Area II.

(29) It is <u>virtually certain</u> that the required additional safe yield can be developed by constructing shallow screened wells in either Area III or Area IV.

(30) A summary of estimated costs for alternative water supply development projects in the four identified areas, is presented in attached Table I.

(31) Cost studies indicate that deep well drilling is the least expensive method of developing additional water supply capacity, since it can be accomplished closer to the existing system.

(32) There should not be any significant differences in annual operating costs between the four alternative projects.

PALMER WATER COMPANY
WATER SUPPLY STUDY

PRELIMINARY REPORT
May 1979

RECOMMENDATIONS

It is recommended that the Palmer Water Company:

(1) Develop the West Plant Well for public water supply use by:

  (a) assembling the necessary pump test and water quality data;

  (b) designing the required production and treatment facilities;

  (c) making application for necessary governmental permits; and

  (d) constructing the required production and treatment facilities.

(2) Undertake a test well drilling program at one or both of the bedrock locations designated on Exhibit A.

(3) With the assistance of the Engineer, and based on available property information, select specific test well drilling sites.

(4) Design and conduct a test well drilling program that acquires all necessary yield and water quality data, and

thereby facilitates the conversion of test wells to production wells.

(5) If the bedrock test well drilling program is not successful, undertake the development of new supply wells in the glacial outwash deposits at either Area III or Area IV shown on Exhibit B.

(6) Evaluate the findings of the well drilling program, and develop a design concept and cost estimates for proposed water supply facilities.

(7) Implement the design and construction of the new water supply facilities, including the acquisition of required permits.

(8) Discontinue the operation of Well No. 9C, and other Curb Wells as soon as replacement supply capacity is developed.

(9) Continue monitoring the water quality of Well No. 9C as long as this supply is kept in operation. Water quality monitoring may be ceased after facility use is discontinued.

(10) Maintain a water quality monitoring program at existing deep wells throughout the future.

TABLE I

ESTIMATED COSTS

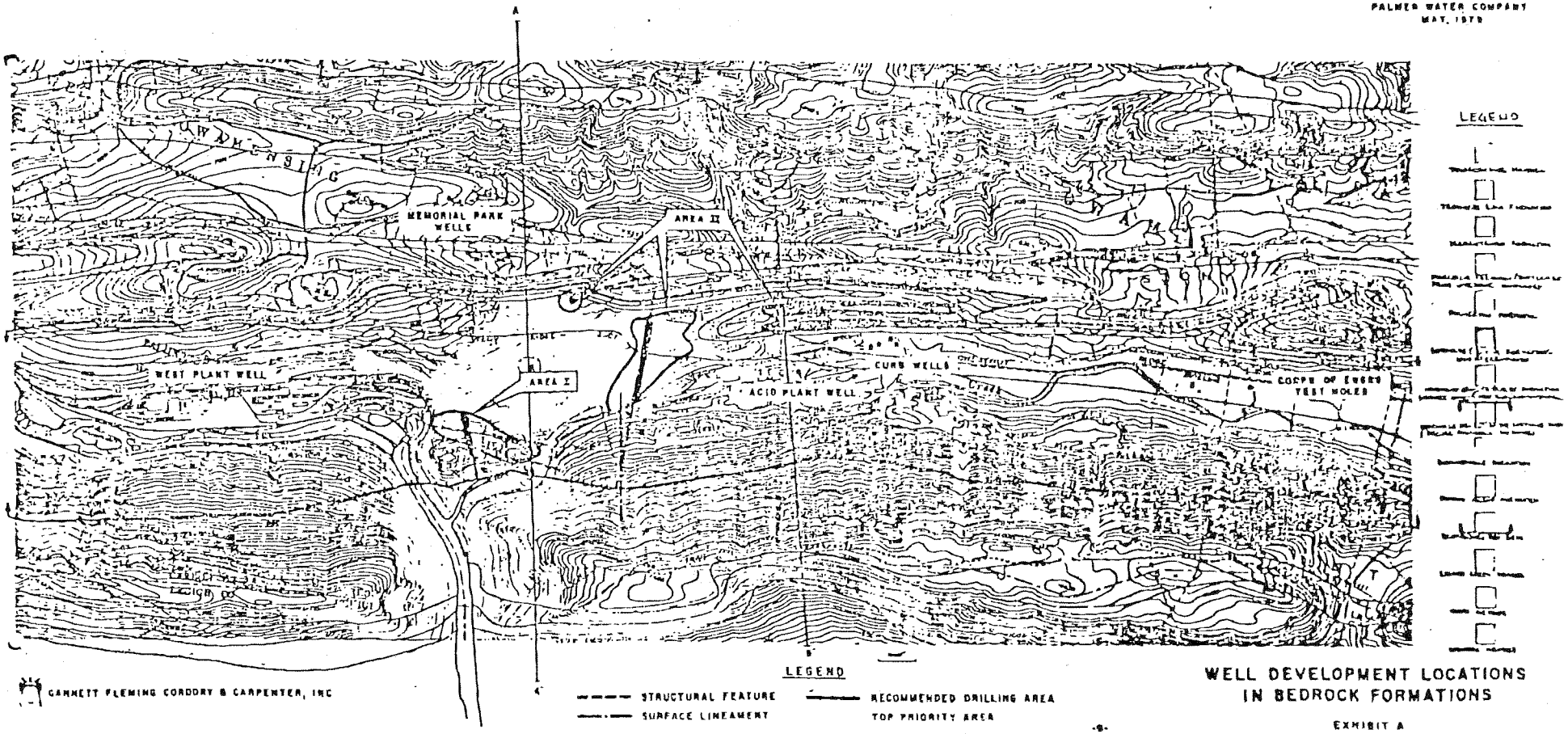
FOR

ALTERNATIVE WATER SUPPLY PROJECTS

PALMER WATER COMPANY

	PLAN I Deep Wells In Bloomsburg	PLAN II Deep Wells In Poxono	PLAN III Wells In Distant Outwash	PLAN IV Wells In Close Outwash
1. Well Development				
Drilling, pump testing, water quality analyses, reaming, etc.	$ 40,000	$ 45,000	$ 65,000	$ 65,000
(Number of Test Wells)	(3)	(3)	(2)	(2)
(Number of Production Wells)	(2)	(2)	(2)	(2)
2. Pumping and Treatment Facilities Pumps, chemical feed (includes chlorine and polyphosphate) electric, controls, chlorine detention, etc.	160,000	160,000	200,000	200,000
3. Connecting Mains From treatment building to system	10,000 (500' of 8")	20,000 (1000' of 8")	150,000 (4050' of 8")	70,000 (7100' of 8")
ESTIMATED CONSTRUCTION COST	$210,000	$225,000	$415,000	$335,000
4. Contingencies, engineering, inspection, financing, permits, and other project costs *approx. 30%)	60,000	65,000	125,000	100,000
ESTIMATED PROJECT COST	$270,000	$290,000	$540,000	$435,000

PALMER WATER COMPANY
MAY, 1978



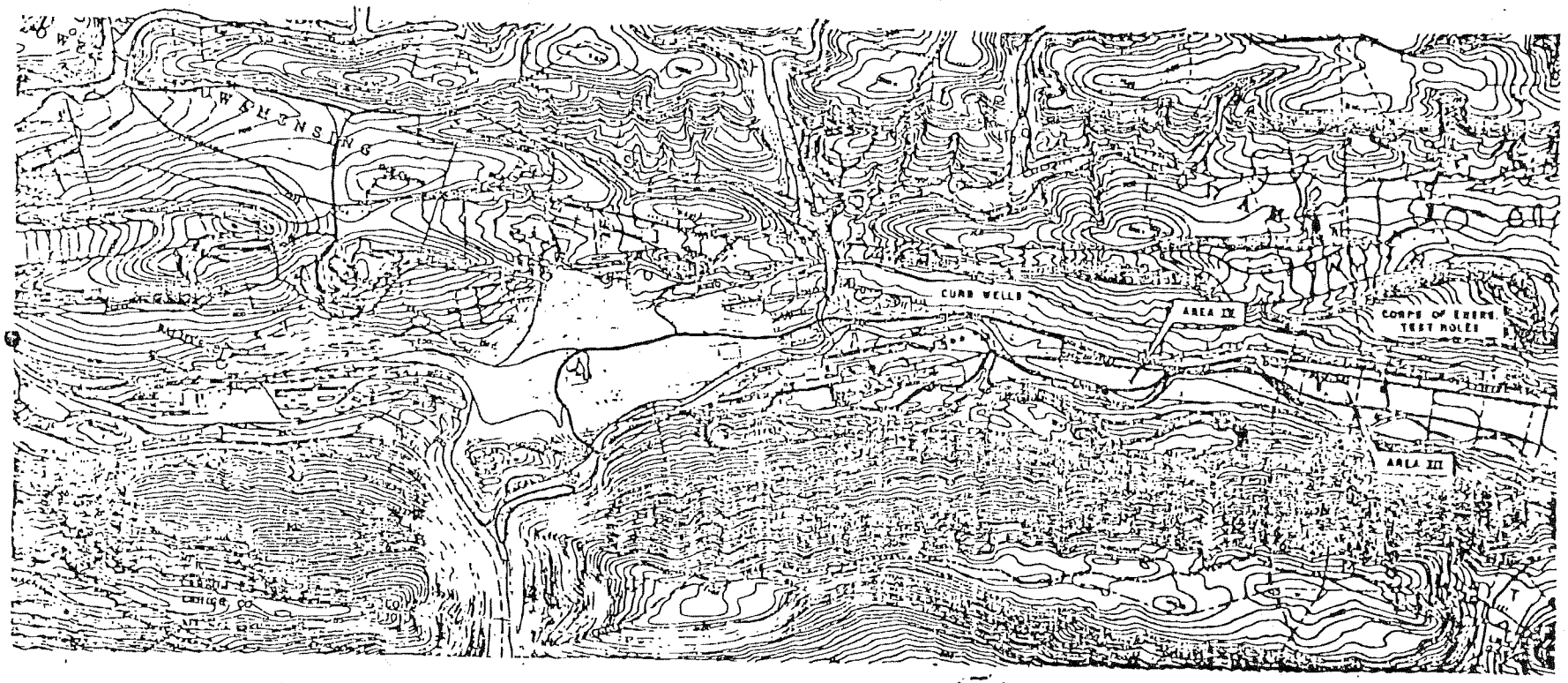
GANNETT FLEMING CORDDRY & CARPENTER, INC

STRUCTURAL FEATURE
SURFACE LINEAMENT
RECOMMENDED DRILLING AREA
TOP PRIORITY AREA

WELL DEVELOPMENT LOCATIONS IN BEDROCK FORMATIONS

EXHIBIT A

PALMER WATER COMPANY
MAY, 1978



CANNETT FLEMING CONDORY & CARPENTER, INC.

WELL DEVELOPMENT LOCATIONS
IN OUTWASH DEPOSITS

EXHIBIT B